

CLAIMS

I claim:

1. A method for environmental monitoring and bioprospecting for microorganisms within a specified environment, said method comprising the steps of:
 - locating a testing device in said environment,
 - wherein said device including a container having a fluid inlet and outlet, said container configured for entry, in situ use and exit from said environment, a plurality of capillary microcosms situated within said container, each of said capillaries having a capillary inlet and outlet that are configured so as to allow for fluid flow through said capillaries, each of said capillaries further having a means for covering said capillary inlet and outlet so as to prevent flow through said capillary,
 - placing in at least one of said capillaries a means for fostering the collection of microorganisms that are indigenous to said surrounding environment when fluid from said surrounding environment is allowed to flow through said capillary,
 - opening said capillary covering means so as to allow fluid from said surrounding environment to flow through said container and capillaries,
 - leaving said device in said environment for a temporal duration sufficient to study phenomena occurring within said capillary microcosms,
 - retrieving said testing device, and
 - analyzing phenomena occurring within said capillary microcosms.
2. A method as recited in Claim 1 wherein said device further including a pump connected to said container, said pump being configured so as to cause the flow of fluid from said surrounding environment into said container inlet and through said capillaries, a means for collecting said fluid that flows through said capillaries, and a check valve connected downstream of said container to prevent the backflow of said fluid into said container.
3. A method as recited in Claim 1 wherein said plurality of capillaries being configured so as to allow for automated analysis of said capillaries using commercially available robotics.

1 4. A method as recited in Claim 2 wherein said plurality of capillaries being
2 configured so as to allow for automated analysis of said capillaries using
3 commercially available robotics.

4 5. A method as recited in Claim 1 wherein said plurality of capillaries being
5 configured in the form of rapidly, exchangeable microtiter plates.

6 6. A method as recited in Claim 2 wherein said plurality of capillaries being
7 configured in the form of rapidly, exchangeable microtiter plates.

8 7. A method as recited in Claim 5 wherein the content of said microtiter plates being
9 lyophilized and vacuum sealed.

10 8. A method as recited in Claim 6 wherein the content of said microtiter plates being
11 lyophilized and vacuum sealed.

12 9. A method as recited in Claim 1, further comprising the step of:

13 before locating said device, placing in at least one of said capillaries a means
14 for containing a specified test substance that can diffuse into the fluid flowing
15 through said capillary.

16 10. A method as recited in Claim 2, further comprising the step of:

17 before locating said device, placing in at least one of said capillaries a means
18 for containing a specified test substance that can diffuse into the fluid flowing
19 through said capillary.

20 11. A method as recited in Claim 3, further comprising the step of:

21 before locating said device, placing in at least one of said capillaries a means
22 for containing a specified test substance that can diffuse into the fluid flowing
23 through said capillary.

24 12 A method as recited in Claim 4, further comprising the step of:

25 before locating said device, placing in at least one of said capillaries a means
26 for containing a specified test substance that can diffuse into the fluid flowing
27 through said capillary.

28 13. A method as recited in Claim 1, further comprising the step of:

29 before locating said device, configuring a capillary microcosm so as to aid in
30 addressing research interests chosen from the group consisting of:

1 the identification and linking of the microbial function occurring in
2 said environment to phylogeny, wherein at least one of said capillaries having
3 placed therein an isotope labeled test compound that can be used in
4 conjunction with SIP,

5 the identification and linking of the microbial function occurring in
6 said environment to phylogeny, wherein at least one of said capillaries having
7 placed therein an isotope labeled test compound that can be used in
8 conjunction with mass spectrometry,

9 the survival in said environment of a specified microorganism,
10 wherein at least one of said capillaries having placed therein said specified
11 microorganism,

12 the fate in said environment of a specified, genetically engineered
13 microorganism, wherein at least one of said capillaries is configured to
14 contain said genetically engineered microorganism,

15 the fate in said environment of a specified pathogen, wherein at least
16 one of said capillaries is configured to contain said pathogen,

17 for a specified process in said environment, the effectiveness of
18 specified, varying test substances for their ability to accelerate said process,
19 wherein said test substances are added to said capillaries,

20 the identification of microorganisms indigenous to said environment
21 that are responsible for a desired bioremediation process in said environment,

22 the effectiveness of said varying bioremediation strategies for said
23 environment, wherein said microcosms are configured to be representative of
24 said varying bioremediation strategies,

25 the effectiveness of said varying bioaugmentation strategies for said
26 environment, wherein said microcosms are configured to be representative of
27 said varying bioaugmentation strategies,

28 the effectiveness of said varying chemical treatment strategies for said
29 environment, wherein said microcosms are configured to be representative of
30 said varying chemical treatment strategies,

1 the intrinsic transformation rates in said environment when said
2 environment is contaminated with a specified contaminant,
3 the enhanced transformation rates in said environment when said
4 environment is contaminated with a specified contaminant, wherein specified
5 nutrients are added to said capillary microcosms,
6 the analysis of the microbial community indigenous to said
7 environment,
8 the proteomic analysis of the microbial community indigenous to said
9 environment,
10 the discovery within said environment of novel microorganisms of
11 potential commercial value,
12 the discovery within said environment of novel biochemical processes
13 of potential commercial value,
14 the discovery within said environment of novel natural products of
15 potential commercial value,
16 the normalization of the test results achieved with said device for
17 differences between when and where said tests are conducted, wherein at least
18 one of said microcosms is configured to serve as an internal standard to which
19 said results can be normalized,
20 the means for enhancing the signal-to-noise ratio in the mass
21 spectrometric analysis of a specified microorganism, wherein at least one of
22 said microcosm configured to foster the growth of said microorganism while
23 limiting the growth and survival of other, non-specified microorganisms,
24 the determination of the fate of a specified compound in said
25 environment for the purpose of chemical risk assessment, wherein at least one
26 of said microcosms having placed therein said compound,
27 the determination of the effect of a specified compound on the
28 microbial community of said environment for the purpose of chemical risk
29 assessment, wherein at least one of said microcosms having placed therein
30 said compound,

1 the determination of the fate of a specified microorganism for the
2 purpose of biological risk assessment, wherein at least one of said microcosms
3 having placed therein said microorganism,

4 the determination of the effect of a specified microorganism on the
5 microbial community of said environment for the purpose of biological risk
6 assessment, wherein at least one of said microcosms having placed therein
7 said specified microorganism,

8 the determination, for environmental monitoring purposes, of the
9 effect of a specified agent in said environment, wherein at least one of said
10 microcosms having placed therein said agent, said placement being such that
11 said agent is retrievable from said microcosm,

12 the determination, for risk assessment purposes, of the effect of a
13 specified agent in said environment, wherein at least one of said microcosms
14 having placed therein said agent, said placement being such that said agent is
15 retrievable from said microcosm,

16 the determination, for environmental treatment purposes of the effect
17 of a specified agent in said environment, wherein at least one of said
18 microcosms having placed therein said agent, said placement being such that
19 said agent is retrievable from said microcosm,

20 the determination, for environmental monitoring purposes, of the
21 effect of a specified agent in said environment, wherein at least one of said
22 microcosms having placed therein said agent and said device being configured
23 such that said fluid from the surrounding environment that comes into contact
24 with said agent in said microcosm is retrievable,

25 the determination, for risk assessment purposes, of the effect of a
26 specified agent in said environment, wherein at least one of said microcosms
27 having placed therein said agent and said device being configured such that
28 said fluid from the surrounding environment that comes into contact with said
29 agent in said microcosm is retrievable,

30 the determination, for environment treatment purposes, of the effect of
31 a specified agent in said environment, wherein at least one of said microcosms

1 having placed therein said agent and said device being configured such that
2 said fluid from the surrounding environment that comes into contact with said
3 agent in said microcosm is retrievable,

4 the determination, for environmental monitoring purposes, of the
5 effect of a specified biochemical process in said environment, wherein said
6 microcosm covering means being configured so that the duration of said
7 process in said microcosm is controllable,

8 the determination, for risk assessment purposes, of the effect of a
9 specified biochemical process in said environment, wherein said microcosm
10 covering means being configured so that the duration of said process in said
11 microcosm is controllable,

12 the determination, for environmental treatment purposes, of the effect
13 of a specified biochemical process in said environment, wherein said
14 microcosm covering means being configured so that the duration of said
15 process in said microcosm is controllable,

16 the elucidation of the in situ metabolic activity of a specified
17 microorganism, wherein at least one of said microcosms having placed therein
18 an isotope labeled test compound which is to be analyzed for the ratio of light
19 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

20 the detection of a specified microorganism in said environment,
21 wherein at least one of said microcosms having placed therein a test
22 compound suitable for increasing the signal-to-noise ratio of a characteristic
23 biomarker of said microorganism during mass spectrometric analysis
24 following in situ biomarker amplification.

25 14. A method as recited in Claim 2, further comprising the step of:

26 before locating said device, configuring a capillary microcosm so as to aid in
27 addressing research interests chosen from the group consisting of:

28 the identification and linking of the microbial function occurring in
29 said environment to phylogeny, wherein at least one of said capillaries having
30 placed therein an isotope labeled test compound that can be used in
31 conjunction with SIP,

1 the identification and linking of the microbial function occurring in
2 said environment to phylogeny, wherein at least one of said capillaries having
3 placed therein an isotope labeled test compound that can be used in
4 conjunction with mass spectrometry,

5 the survival in said environment of a specified microorganism,
6 wherein at least one of said capillaries having placed therein said specified
7 microorganism,

8 the fate in said environment of a specified, genetically engineered
9 microorganism, wherein at least one of said capillaries is configured to
10 contain said genetically engineered microorganism,

11 the fate in said environment of a specified pathogen, wherein at least
12 one of said capillaries is configured to contain said pathogen,

13 for a specified process in said environment, the effectiveness of
14 specified, varying test substances for their ability to accelerate said process,
15 wherein said test substances are added to said capillaries,

16 the identification of microorganisms indigenous to said environment
17 that are responsible for a desired bioremediation process in said environment,

18 the effectiveness of said varying bioremediation strategies for said
19 environment, wherein said microcosms are configured to be representative of
20 said varying bioremediation strategies,

21 the effectiveness of said varying bioaugmentation strategies for said
22 environment, wherein said microcosms are configured to be representative of
23 said varying bioaugmentation strategies,

24 the effectiveness of said varying chemical treatment strategies for said
25 environment, wherein said microcosms are configured to be representative of
26 said varying chemical treatment strategies,

27 the intrinsic transformation rates in said environment when said
28 environment is contaminated with a specified contaminant,

29 the enhanced transformation rates in said environment when said
30 environment is contaminated with a specified contaminant, wherein specified
31 nutrients are added to said capillary microcosms,

1 the analysis of the microbial community indigenous to said
2 environment,

3 the proteomic analysis of the microbial community indigenous to said
4 environment,

5 the discovery within said environment of novel microorganisms of
6 potential commercial value,

7 the discovery within said environment of novel biochemical processes
8 of potential commercial value,

9 the discovery within said environment of novel natural products of
10 potential commercial value,

11 the normalization of the test results achieved with said device for
12 differences between when and where said tests are conducted, wherein at least
13 one of said microcosms is configured to serve as an internal standard to which
14 said results can be normalized,

15 the means for enhancing the signal-to-noise ratio in the mass
16 spectrometric analysis of a specified microorganism, wherein at least one of
17 said microcosm configured to foster the growth of said microorganism while
18 limiting the growth and survival of other, non-specified microorganisms,

19 the determination of the fate of a specified compound in said
20 environment for the purpose of chemical risk assessment, wherein at least one
21 of said microcosms having placed therein said compound,

22 the determination of the effect of a specified compound on the
23 microbial community of said environment for the purpose of chemical risk
24 assessment, wherein at least one of said microcosms having placed therein
25 said compound,

26 the determination of the fate of a specified microorganism for the
27 purpose of biological risk assessment, wherein at least one of said microcosms
28 having placed therein said microorganism,

29 the determination of the effect of a specified microorganism on the
30 microbial community of said environment for the purpose of biological risk

1 assessment, wherein at least one of said microcosms having placed therein
2 said specified microorganism,

3 the determination, for environmental monitoring purposes, of the
4 effect of a specified agent in said environment, wherein at least one of said
5 microcosms having placed therein said agent, said placement being such that
6 said agent is retrievable from said microcosm,

7 the determination, for risk assessment purposes, of the effect of a
8 specified agent in said environment, wherein at least one of said microcosms
9 having placed therein said agent, said placement being such that said agent is
10 retrievable from said microcosm,

11 the determination, for environmental treatment purposes of the effect
12 of a specified agent in said environment, wherein at least one of said
13 microcosms having placed therein said agent, said placement being such that
14 said agent is retrievable from said microcosm,

15 the determination, for environmental monitoring purposes, of the
16 effect of a specified agent in said environment, wherein at least one of said
17 microcosms having placed therein said agent and said device being configured
18 such that said fluid from the surrounding environment that comes into contact
19 with said agent in said microcosm is retrievable,

20 the determination, for risk assessment purposes, of the effect of a
21 specified agent in said environment, wherein at least one of said microcosms
22 having placed therein said agent and said device being configured such that
23 said fluid from the surrounding environment that comes into contact with said
24 agent in said microcosm is retrievable,

25 the determination, for environment treatment purposes, of the effect of
26 a specified agent in said environment, wherein at least one of said microcosms
27 having placed therein said agent and said device being configured such that
28 said fluid from the surrounding environment that comes into contact with said
29 agent in said microcosm is retrievable,

30 the determination, for environmental monitoring purposes, of the
31 effect of a specified biochemical process in said environment, wherein said

1 microcosm covering means being configured so that the duration of said
2 process in said microcosm is controllable,

3 the determination, for risk assessment purposes, of the effect of a
4 specified biochemical process in said environment, wherein said microcosm
5 covering means being configured so that the duration of said process in said
6 microcosm is controllable,

7 the determination, for environmental treatment purposes, of the effect
8 of a specified biochemical process in said environment, wherein said
9 microcosm covering means being configured so that the duration of said
10 process in said microcosm is controllable,

11 the elucidation of the in situ metabolic activity of a specified
12 microorganism, wherein at least one of said microcosms having placed therein
13 an isotope labeled test compound which is to be analyzed for the ratio of light
14 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

15 the detection of a specified microorganism in said environment,
16 wherein at least one of said microcosms having placed therein a test
17 compound suitable for increasing the signal-to-noise ratio of a characteristic
18 biomarker of said microorganism during mass spectrometric analysis
19 following in situ biomarker amplification.

20 15. A method as recited in Claim 3, further comprising the step of:

21 before locating said device, configuring a capillary microcosm so as to aid in
22 addressing research interests chosen from the group consisting of:

23 the identification and linking of the microbial function occurring in
24 said environment to phylogeny, wherein at least one of said capillaries having
25 placed therein an isotope labeled test compound that can be used in
26 conjunction with SIP,

27 the identification and linking of the microbial function occurring in
28 said environment to phylogeny, wherein at least one of said capillaries having
29 placed therein an isotope labeled test compound that can be used in
30 conjunction with mass spectrometry,

1 the survival in said environment of a specified microorganism,
2 wherein at least one of said capillaries having placed therein said specified
3 microorganism,

4 the fate in said environment of a specified, genetically engineered
5 microorganism, wherein at least one of said capillaries is configured to
6 contain said genetically engineered microorganism,

7 the fate in said environment of a specified pathogen, wherein at least
8 one of said capillaries is configured to contain said pathogen,

9 for a specified process in said environment, the effectiveness of
10 specified, varying test substances for their ability to accelerate said process,
11 wherein said test substances are added to said capillaries,

12 the identification of microorganisms indigenous to said environment
13 that are responsible for a desired bioremediation process in said environment,

14 the effectiveness of said varying bioremediation strategies for said
15 environment, wherein said microcosms are configured to be representative of
16 said varying bioremediation strategies,

17 the effectiveness of said varying bioaugmentation strategies for said
18 environment, wherein said microcosms are configured to be representative of
19 said varying bioaugmentation strategies,

20 the effectiveness of said varying chemical treatment strategies for said
21 environment, wherein said microcosms are configured to be representative of
22 said varying chemical treatment strategies,

23 the intrinsic transformation rates in said environment when said
24 environment is contaminated with a specified contaminant,

25 the enhanced transformation rates in said environment when said
26 environment is contaminated with a specified contaminant, wherein specified
27 nutrients are added to said capillary microcosms,

28 the analysis of the microbial community indigenous to said
29 environment,

30 the proteomic analysis of the microbial community indigenous to said
31 environment,

1 the discovery within said environment of novel microorganisms of
2 potential commercial value,

3 the discovery within said environment of novel biochemical processes
4 of potential commercial value,

5 the discovery within said environment of novel natural products of
6 potential commercial value,

7 the normalization of the test results achieved with said device for
8 differences between when and where said tests are conducted, wherein at least
9 one of said microcosms is configured to serve as an internal standard to which
10 said results can be normalized,

11 the means for enhancing the signal-to-noise ratio in the mass
12 spectrometric analysis of a specified microorganism, wherein at least one of
13 said microcosm configured to foster the growth of said microorganism while
14 limiting the growth and survival of other, non-specified microorganisms,

15 the determination of the fate of a specified compound in said
16 environment for the purpose of chemical risk assessment, wherein at least one
17 of said microcosms having placed therein said compound,

18 the determination of the effect of a specified compound on the
19 microbial community of said environment for the purpose of chemical risk
20 assessment, wherein at least one of said microcosms having placed therein
21 said compound,

22 the determination of the fate of a specified microorganism for the
23 purpose of biological risk assessment, wherein at least one of said microcosms
24 having placed therein said microorganism,

25 the determination of the effect of a specified microorganism on the
26 microbial community of said environment for the purpose of biological risk
27 assessment, wherein at least one of said microcosms having placed therein
28 said specified microorganism,

29 the determination, for environmental monitoring purposes, of the
30 effect of a specified agent in said environment, wherein at least one of said

1 microcosms having placed therein said agent, said placement being such that
2 said agent is retrievable from said microcosm,

3 the determination, for risk assessment purposes, of the effect of a
4 specified agent in said environment, wherein at least one of said microcosms
5 having placed therein said agent, said placement being such that said agent is
6 retrievable from said microcosm,

7 the determination, for environmental treatment purposes of the effect
8 of a specified agent in said environment, wherein at least one of said
9 microcosms having placed therein said agent, said placement being such that
10 said agent is retrievable from said microcosm,

11 the determination, for environmental monitoring purposes, of the
12 effect of a specified agent in said environment, wherein at least one of said
13 microcosms having placed therein said agent and said device being configured
14 such that said fluid from the surrounding environment that comes into contact
15 with said agent in said microcosm is retrievable,

16 the determination, for risk assessment purposes, of the effect of a
17 specified agent in said environment, wherein at least one of said microcosms
18 having placed therein said agent and said device being configured such that
19 said fluid from the surrounding environment that comes into contact with said
20 agent in said microcosm is retrievable,

21 the determination, for environment treatment purposes, of the effect of
22 a specified agent in said environment, wherein at least one of said microcosms
23 having placed therein said agent and said device being configured such that
24 said fluid from the surrounding environment that comes into contact with said
25 agent in said microcosm is retrievable,

26 the determination, for environmental monitoring purposes, of the
27 effect of a specified biochemical process in said environment, wherein said
28 microcosm covering means being configured so that the duration of said
29 process in said microcosm is controllable,

30 the determination, for risk assessment purposes, of the effect of a
31 specified biochemical process in said environment, wherein said microcosm

1 covering means being configured so that the duration of said process in said
2 microcosm is controllable,

3 the determination, for environmental treatment purposes, of the effect
4 of a specified biochemical process in said environment, wherein said
5 microcosm covering means being configured so that the duration of said
6 process in said microcosm is controllable,

7 the elucidation of the in situ metabolic activity of a specified
8 microorganism, wherein at least one of said microcosms having placed therein
9 an isotope labeled test compound which is to be analyzed for the ratio of light
10 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

11 the detection of a specified microorganism in said environment,
12 wherein at least one of said microcosms having placed therein a test
13 compound suitable for increasing the signal-to-noise ratio of a characteristic
14 biomarker of said microorganism during mass spectrometric analysis
15 following in situ biomarker amplification.

16 16. A method as recited in Claim 4, further comprising the step of:

17 before locating said device, configuring a capillary microcosm so as to aid in
18 addressing research interests chosen from the group consisting of:

19 the identification and linking of the microbial function occurring in
20 said environment to phylogeny, wherein at least one of said capillaries having
21 placed therein an isotope labeled test compound that can be used in
22 conjunction with SIP,

23 the identification and linking of the microbial function occurring in
24 said environment to phylogeny, wherein at least one of said capillaries having
25 placed therein an isotope labeled test compound that can be used in
26 conjunction with mass spectrometry,

27 the survival in said environment of a specified microorganism,
28 wherein at least one of said capillaries having placed therein said specified
29 microorganism,

1 the fate in said environment of a specified, genetically engineered
2 microorganism, wherein at least one of said capillaries is configured to
3 contain said genetically engineered microorganism,

4 the fate in said environment of a specified pathogen, wherein at least
5 one of said capillaries is configured to contain said pathogen,

6 for a specified process in said environment, the effectiveness of
7 specified, varying test substances for their ability to accelerate said process,
8 wherein said test substances are added to said capillaries,

9 the identification of microorganisms indigenous to said environment
10 that are responsible for a desired bioremediation process in said environment,

11 the effectiveness of said varying bioremediation strategies for said
12 environment, wherein said microcosms are configured to be representative of
13 said varying bioremediation strategies,

14 the effectiveness of said varying bioaugmentation strategies for said
15 environment, wherein said microcosms are configured to be representative of
16 said varying bioaugmentation strategies,

17 the effectiveness of said varying chemical treatment strategies for said
18 environment, wherein said microcosms are configured to be representative of
19 said varying chemical treatment strategies,

20 the intrinsic transformation rates in said environment when said
21 environment is contaminated with a specified contaminant,

22 the enhanced transformation rates in said environment when said
23 environment is contaminated with a specified contaminant, wherein specified
24 nutrients are added to said capillary microcosms,

25 the analysis of the microbial community indigenous to said
26 environment,

27 the proteomic analysis of the microbial community indigenous to said
28 environment,

29 the discovery within said environment of novel microorganisms of
30 potential commercial value,

1 the discovery within said environment of novel biochemical processes
2 of potential commercial value,

3 the discovery within said environment of novel natural products of
4 potential commercial value,

5 the normalization of the test results achieved with said device for
6 differences between when and where said tests are conducted, wherein at least
7 one of said microcosms is configured to serve as an internal standard to which
8 said results can be normalized,

9 the means for enhancing the signal-to-noise ratio in the mass
10 spectrometric analysis of a specified microorganism, wherein at least one of
11 said microcosm configured to foster the growth of said microorganism while
12 limiting the growth and survival of other, non-specified microorganisms,

13 the determination of the fate of a specified compound in said
14 environment for the purpose of chemical risk assessment, wherein at least one
15 of said microcosms having placed therein said compound,

16 the determination of the effect of a specified compound on the
17 microbial community of said environment for the purpose of chemical risk
18 assessment, wherein at least one of said microcosms having placed therein
19 said compound,

20 the determination of the fate of a specified microorganism for the
21 purpose of biological risk assessment, wherein at least one of said microcosms
22 having placed therein said microorganism,

23 the determination of the effect of a specified microorganism on the
24 microbial community of said environment for the purpose of biological risk
25 assessment, wherein at least one of said microcosms having placed therein
26 said specified microorganism,

27 the determination, for environmental monitoring purposes, of the
28 effect of a specified agent in said environment, wherein at least one of said
29 microcosms having placed therein said agent, said placement being such that
30 said agent is retrievable from said microcosm,

1 the determination, for risk assessment purposes, of the effect of a
2 specified agent in said environment, wherein at least one of said microcosms
3 having placed therein said agent, said placement being such that said agent is
4 retrievable from said microcosm,

5 the determination, for environmental treatment purposes of the effect
6 of a specified agent in said environment, wherein at least one of said
7 microcosms having placed therein said agent, said placement being such that
8 said agent is retrievable from said microcosm,

9 the determination, for environmental monitoring purposes, of the
10 effect of a specified agent in said environment, wherein at least one of said
11 microcosms having placed therein said agent and said device being configured
12 such that said fluid from the surrounding environment that comes into contact
13 with said agent in said microcosm is retrievable,

14 the determination, for risk assessment purposes, of the effect of a
15 specified agent in said environment, wherein at least one of said microcosms
16 having placed therein said agent and said device being configured such that
17 said fluid from the surrounding environment that comes into contact with said
18 agent in said microcosm is retrievable,

19 the determination, for environment treatment purposes, of the effect of
20 a specified agent in said environment, wherein at least one of said microcosms
21 having placed therein said agent and said device being configured such that
22 said fluid from the surrounding environment that comes into contact with said
23 agent in said microcosm is retrievable,

24 the determination, for environmental monitoring purposes, of the
25 effect of a specified biochemical process in said environment, wherein said
26 microcosm covering means being configured so that the duration of said
27 process in said microcosm is controllable,

28 the determination, for risk assessment purposes, of the effect of a
29 specified biochemical process in said environment, wherein said microcosm
30 covering means being configured so that the duration of said process in said
31 microcosm is controllable,

1 the determination, for environmental treatment purposes, of the effect
2 of a specified biochemical process in said environment, wherein said
3 microcosm covering means being configured so that the duration of said
4 process in said microcosm is controllable,

5 the elucidation of the in situ metabolic activity of a specified
6 microorganism, wherein at least one of said microcosms having placed therein
7 an isotope labeled test compound which is to be analyzed for the ratio of light
8 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

9 the detection of a specified microorganism in said environment,
10 wherein at least one of said microcosms having placed therein a test
11 compound suitable for increasing the signal-to-noise ratio of a characteristic
12 biomarker of said microorganism during mass spectrometric analysis
13 following in situ biomarker amplification.

14 17. A testing device for environmental monitoring and bioprospecting for
15 microorganisms within a specified environment, said device comprising:

16 a means for providing a plurality of physically separated, test microcosms that
17 are so configured as to allow for fluid flow through said microcosms,

18 a means for containing and protecting said test microcosms as they are placed
19 in said environment, said means further providing for the flow of fluid from said
20 surrounding environment to enter and flow through said microcosms, and

21 a means for covering said fluid flow paths through said microcosms so as to
22 regulate the flow through said microcosms.

23 18. A testing device as recited in Claim 17:

24 wherein said plurality of microcosms being configured so as to allow for
25 automated analysis of said microcosms using commercially available robotics.

26 19. A testing device as recited in Claim 17, further comprising:

27 a means for causing fluid flow from said surrounding environment and
28 through said microcosms,

29 a means for collecting and retaining said fluid flowing through said
30 microcosms, and

1 a means downstream from said microcosms for preventing backflow of said
2 fluid into said microcosms.

3 20. A testing device as recited in Claim 18, further comprising:

4 a means for causing fluid flow from said surrounding environment and
5 through said microcosms,

6 a means for collecting and retaining said fluid flowing through said
7 microcosms, and

8 a means downstream from said microcosms for preventing backflow of said
9 fluid into said microcosms.

10 21. A testing device as recited in Claim 17 further comprising a means in at least one
11 of said microcosms configured for fostering the collection of said microorganisms
12 that enter said microcosm.

13 22. A testing device as recited in Claim 18 further comprising a means in at least one
14 of said microcosms configured for fostering the collection of said microorganisms
15 that enter said microcosm.

16 23. A testing device as recited in Claim 19 further comprising a means in at least one
17 of said microcosms configured for fostering the collection of said microorganisms
18 that enter said microcosm.

19 24. A testing device as recited in Claim 20 further comprising a means in at least one
20 of said microcosms configured for fostering the collection of said microorganisms
21 that enter said microcosm.

22 25. A testing device as recited in Claim 17 wherein at least one of said microcosms
23 having a means for containing a specified test substance that can diffuse into the fluid
24 flowing through said microcosm.

25 26. A testing device as recited in Claim 18 wherein at least one of said microcosms
26 having a means for containing a specified test substance that can diffuse into the fluid
27 flowing through said microcosm.

28 27. A testing device as recited in Claim 19 wherein at least one of said microcosms
29 having a means for containing a specified test substance that can diffuse into the fluid
30 flowing through said microcosm.

- 1 28. A testing device as recited in Claim 20 wherein at least one of said microcosms
2 having a means for containing a specified test substance that can diffuse into the fluid
3 flowing through said microcosm.
- 4 29. A testing device as recited in Claim 17 wherein said plurality of test microcosms
5 being configured in the form of a rapidly, exchangeable microtiter plate.
- 6 30. A testing device as recited in Claim 18 wherein said plurality of test microcosms
7 being configured in the form of a rapidly, exchangeable microtiter plate.
- 8 31. A testing device as recited in Claim 19 wherein said plurality of test microcosms
9 being configured in the form of a rapidly, exchangeable microtiter plate.
- 10 32. A testing device as recited in Claim 20 wherein said plurality of test microcosms
11 being configured in the form of a rapidly, exchangeable microtiter plate.
- 12 33. A testing device as recited in Claim 29 wherein the content of said microtiter
13 plate being lyophilized and vacuum sealed.
- 14 34. A testing device as recited in Claim 30 wherein the content of said microtiter
15 plate being lyophilized and vacuum sealed.
- 16 35. A testing device as recited in Claim 31 wherein the content of said microtiter
17 plate being lyophilized and vacuum sealed.
- 18 36. A testing device as recited in Claim 32 wherein the content of said microtiter
19 plate being lyophilized and vacuum sealed.
- 20 37. A testing device as recited in Claim 17, wherein a test microcosm configured so
21 as to aid in addressing research interests chosen from the group consisting of:
- 22 the identification and linking of the microbial function occurring in
23 said environment to phylogeny, wherein at least one of said microcosms
24 having placed therein an isotope labeled test compound that can be used in
25 conjunction with SIP,
- 26 the identification and linking of the microbial function occurring in
27 said environment to phylogeny, wherein at least one of said microcosms
28 having placed therein an isotope labeled test compound that can be used in
29 conjunction with mass spectrometry,

1 the survival in said environment of a specified microorganism,
2 wherein at least one of said microcosms having placed therein said specified
3 microorganism,

4 the fate in said environment of a specified, genetically engineered
5 microorganism, wherein at least one of said microcosms is configured to
6 contain said genetically engineered microorganism,

7 the fate in said environment of a specified pathogen, wherein at least
8 one of said microcosms is configured to contain said pathogen,

9 for a specified process in said environment, the effectiveness of
10 specified, varying test substances for their ability to accelerate said process,
11 wherein said test substances are added to said microcosms,

12 the identification of microorganisms indigenous to said environment
13 that are responsible for a desired bioremediation process in said environment,

14 the effectiveness of said varying bioremediation strategies for said
15 environment, wherein said microcosms are configured to be representative of
16 said varying bioremediation strategies,

17 the effectiveness of said varying bioaugmentation strategies for said
18 environment, wherein said microcosms are configured to be representative of
19 said varying bioaugmentation strategies,

20 the effectiveness of said varying chemical treatment strategies for said
21 environment, wherein said microcosms are configured to be representative of
22 said varying chemical treatment strategies,

23 the intrinsic transformation rates in said environment when said
24 environment is contaminated with a specified contaminant,

25 the enhanced transformation rates in said environment when said
26 environment is contaminated with a specified contaminant, wherein specified
27 nutrients are added to said microcosms,

28 the analysis of the microbial community indigenous to said
29 environment,

30 the proteomic analysis of the microbial community indigenous to said
31 environment,

1 the discovery within said environment of novel microorganisms of
2 potential commercial value,

3 the discovery within said environment of novel biochemical processes
4 of potential commercial value,

5 the discovery within said environment of novel natural products of
6 potential commercial value,

7 the normalization of the test results achieved with said device for
8 differences between when and where said tests are conducted, wherein at least
9 one of said microcosms is configured to serve as an internal standard to which
10 said results can be normalized,

11 the means for enhancing the signal-to-noise ratio in the mass
12 spectrometric analysis of a specified microorganism, wherein at least one of
13 said microcosm configured to foster the growth of said microorganism while
14 limiting the growth and survival of other, non-specified microorganisms,

15 the determination of the fate of a specified compound in said
16 environment for the purpose of chemical risk assessment, wherein at least one
17 of said microcosms having placed therein said compound,

18 the determination of the effect of a specified compound on the
19 microbial community of said environment for the purpose of chemical risk
20 assessment, wherein at least one of said microcosms having placed therein
21 said compound,

22 the determination of the fate of a specified microorganism for the
23 purpose of biological risk assessment, wherein at least one of said microcosms
24 having placed therein said microorganism,

25 the determination of the effect of a specified microorganism on the
26 microbial community of said environment for the purpose of biological risk
27 assessment, wherein at least one of said microcosms having placed therein
28 said specified microorganism,

29 the determination, for environmental monitoring purposes, of the
30 effect of a specified agent in said environment, wherein at least one of said

1 microcosms having placed therein said agent, said placement being such that
2 said agent is retrievable from said microcosm,

3 the determination, for risk assessment purposes, of the effect of a
4 specified agent in said environment, wherein at least one of said microcosms
5 having placed therein said agent, said placement being such that said agent is
6 retrievable from said microcosm,

7 the determination, for environmental treatment purposes of the effect
8 of a specified agent in said environment, wherein at least one of said
9 microcosms having placed therein said agent, said placement being such that
10 said agent is retrievable from said microcosm,

11 the determination, for environmental monitoring purposes, of the
12 effect of a specified agent in said environment, wherein at least one of said
13 microcosms having placed therein said agent and said device being configured
14 such that said fluid from the surrounding environment that comes into contact
15 with said agent in said microcosm is retrievable,

16 the determination, for risk assessment purposes, of the effect of a
17 specified agent in said environment, wherein at least one of said microcosms
18 having placed therein said agent and said device being configured such that
19 said fluid from the surrounding environment that comes into contact with said
20 agent in said microcosm is retrievable,

21 the determination, for environment treatment purposes, of the effect of
22 a specified agent in said environment, wherein at least one of said microcosms
23 having placed therein said agent and said device being configured such that
24 said fluid from the surrounding environment that comes into contact with said
25 agent in said microcosm is retrievable,

26 the determination, for environmental monitoring purposes, of the
27 effect of a specified biochemical process in said environment, wherein said
28 microcosm covering means being configured so that the duration of said
29 process in said microcosm is controllable,

30 the determination, for risk assessment purposes, of the effect of a
31 specified biochemical process in said environment, wherein said microcosm

1 covering means being configured so that the duration of said process in said
2 microcosm is controllable,

3 the determination, for environmental treatment purposes, of the effect
4 of a specified biochemical process in said environment, wherein said
5 microcosm covering means being configured so that the duration of said
6 process in said microcosm is controllable,

7 the elucidation of the in situ metabolic activity of a specified
8 microorganism, wherein at least one of said microcosms having placed therein
9 an isotope labeled test compound which is to be analyzed for the ratio of light
10 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

11 the detection of a specified microorganism in said environment,
12 wherein at least one of said microcosms having placed therein a test
13 compound suitable for increasing the signal-to-noise ratio of a characteristic
14 biomarker of said microorganism during mass spectrometric analysis
15 following in situ biomarker amplification.

16 38. A testing device as recited in Claim 18, wherein a test microcosm configured so
17 as to aid in addressing research interests chosen from the group consisting of:

18 the identification and linking of the microbial function occurring in
19 said environment to phylogeny, wherein at least one of said microcosms
20 having placed therein an isotope labeled test compound that can be used in
21 conjunction with SIP,

22 the identification and linking of the microbial function occurring in
23 said environment to phylogeny, wherein at least one of said microcosms
24 having placed therein an isotope labeled test compound that can be used in
25 conjunction with mass spectrometry,

26 the survival in said environment of a specified microorganism,
27 wherein at least one of said microcosms having placed therein said specified
28 microorganism,

29 the fate in said environment of a specified, genetically engineered
30 microorganism, wherein at least one of said microcosms is configured to
31 contain said genetically engineered microorganism,

1 the fate in said environment of a specified pathogen, wherein at least
2 one of said microcosms is configured to contain said pathogen,

3 for a specified process in said environment, the effectiveness of
4 specified, varying test substances for their ability to accelerate said process,
5 wherein said test substances are added to said microcosms,

6 the identification of microorganisms indigenous to said environment
7 that are responsible for a desired bioremediation process in said environment,

8 the effectiveness of said varying bioremediation strategies for said
9 environment, wherein said microcosms are configured to be representative of
10 said varying bioremediation strategies,

11 the effectiveness of said varying bioaugmentation strategies for said
12 environment, wherein said microcosms are configured to be representative of
13 said varying bioaugmentation strategies,

14 the effectiveness of said varying chemical treatment strategies for said
15 environment, wherein said microcosms are configured to be representative of
16 said varying chemical treatment strategies,

17 the intrinsic transformation rates in said environment when said
18 environment is contaminated with a specified contaminant,

19 the enhanced transformation rates in said environment when said
20 environment is contaminated with a specified contaminant, wherein specified
21 nutrients are added to said microcosms,

22 the analysis of the microbial community indigenous to said
23 environment,

24 the proteomic analysis of the microbial community indigenous to said
25 environment,

26 the discovery within said environment of novel microorganisms of
27 potential commercial value,

28 the discovery within said environment of novel biochemical processes
29 of potential commercial value,

30 the discovery within said environment of novel natural products of
31 potential commercial value,

1 the normalization of the test results achieved with said device for
2 differences between when and where said tests are conducted, wherein at least
3 one of said microcosms is configured to serve as an internal standard to which
4 said results can be normalized,

5 the means for enhancing the signal-to-noise ratio in the mass
6 spectrometric analysis of a specified microorganism, wherein at least one of
7 said microcosm configured to foster the growth of said microorganism while
8 limiting the growth and survival of other, non-specified microorganisms,

9 the determination of the fate of a specified compound in said
10 environment for the purpose of chemical risk assessment, wherein at least one
11 of said microcosms having placed therein said compound,

12 the determination of the effect of a specified compound on the
13 microbial community of said environment for the purpose of chemical risk
14 assessment, wherein at least one of said microcosms having placed therein
15 said compound,

16 the determination of the fate of a specified microorganism for the
17 purpose of biological risk assessment, wherein at least one of said microcosms
18 having placed therein said microorganism,

19 the determination of the effect of a specified microorganism on the
20 microbial community of said environment for the purpose of biological risk
21 assessment, wherein at least one of said microcosms having placed therein
22 said specified microorganism,

23 the determination, for environmental monitoring purposes, of the
24 effect of a specified agent in said environment, wherein at least one of said
25 microcosms having placed therein said agent, said placement being such that
26 said agent is retrievable from said microcosm,

27 the determination, for risk assessment purposes, of the effect of a
28 specified agent in said environment, wherein at least one of said microcosms
29 having placed therein said agent, said placement being such that said agent is
30 retrievable from said microcosm,

1 the determination, for environmental treatment purposes of the effect
2 of a specified agent in said environment, wherein at least one of said
3 microcosms having placed therein said agent, said placement being such that
4 said agent is retrievable from said microcosm,

5 the determination, for environmental monitoring purposes, of the
6 effect of a specified agent in said environment, wherein at least one of said
7 microcosms having placed therein said agent and said device being configured
8 such that said fluid from the surrounding environment that comes into contact
9 with said agent in said microcosm is retrievable,

10 the determination, for risk assessment purposes, of the effect of a
11 specified agent in said environment, wherein at least one of said microcosms
12 having placed therein said agent and said device being configured such that
13 said fluid from the surrounding environment that comes into contact with said
14 agent in said microcosm is retrievable,

15 the determination, for environment treatment purposes, of the effect of
16 a specified agent in said environment, wherein at least one of said microcosms
17 having placed therein said agent and said device being configured such that
18 said fluid from the surrounding environment that comes into contact with said
19 agent in said microcosm is retrievable,

20 the determination, for environmental monitoring purposes, of the
21 effect of a specified biochemical process in said environment, wherein said
22 microcosm covering means being configured so that the duration of said
23 process in said microcosm is controllable,

24 the determination, for risk assessment purposes, of the effect of a
25 specified biochemical process in said environment, wherein said microcosm
26 covering means being configured so that the duration of said process in said
27 microcosm is controllable,

28 the determination, for environmental treatment purposes, of the effect
29 of a specified biochemical process in said environment, wherein said
30 microcosm covering means being configured so that the duration of said
31 process in said microcosm is controllable,

1 the elucidation of the in situ metabolic activity of a specified
2 microorganism, wherein at least one of said microcosms having placed therein
3 an isotope labeled test compound which is to be analyzed for the ratio of light
4 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or
5 the detection of a specified microorganism in said environment,
6 wherein at least one of said microcosms having placed therein a test
7 compound suitable for increasing the signal-to-noise ratio of a characteristic
8 biomarker of said microorganism during mass spectrometric analysis
9 following in situ biomarker amplification.

10 39. A testing device as recited in Claim 19, wherein a test microcosm configured so
11 as to aid in addressing research interests chosen from the group consisting of:

12 the identification and linking of the microbial function occurring in
13 said environment to phylogeny, wherein at least one of said microcosms
14 having placed therein an isotope labeled test compound that can be used in
15 conjunction with SIP,

16 the identification and linking of the microbial function occurring in
17 said environment to phylogeny, wherein at least one of said microcosms
18 having placed therein an isotope labeled test compound that can be used in
19 conjunction with mass spectrometry,

20 the survival in said environment of a specified microorganism,
21 wherein at least one of said microcosms having placed therein said specified
22 microorganism,

23 the fate in said environment of a specified, genetically engineered
24 microorganism, wherein at least one of said microcosms is configured to
25 contain said genetically engineered microorganism,

26 the fate in said environment of a specified pathogen, wherein at least
27 one of said microcosms is configured to contain said pathogen,

28 for a specified process in said environment, the effectiveness of
29 specified, varying test substances for their ability to accelerate said process,
30 wherein said test substances are added to said microcosms,

1 the identification of microorganisms indigenous to said environment
2 that are responsible for a desired bioremediation process in said environment,
3 the effectiveness of said varying bioremediation strategies for said
4 environment, wherein said microcosms are configured to be representative of
5 said varying bioremediation strategies,

6 the effectiveness of said varying bioaugmentation strategies for said
7 environment, wherein said microcosms are configured to be representative of
8 said varying bioaugmentation strategies,

9 the effectiveness of said varying chemical treatment strategies for said
10 environment, wherein said microcosms are configured to be representative of
11 said varying chemical treatment strategies,

12 the intrinsic transformation rates in said environment when said
13 environment is contaminated with a specified contaminant,

14 the enhanced transformation rates in said environment when said
15 environment is contaminated with a specified contaminant, wherein specified
16 nutrients are added to said microcosms,

17 the analysis of the microbial community indigenous to said
18 environment,

19 the proteomic analysis of the microbial community indigenous to said
20 environment,

21 the discovery within said environment of novel microorganisms of
22 potential commercial value,

23 the discovery within said environment of novel biochemical processes
24 of potential commercial value,

25 the discovery within said environment of novel natural products of
26 potential commercial value,

27 the normalization of the test results achieved with said device for
28 differences between when and where said tests are conducted, wherein at least
29 one of said microcosms is configured to serve as an internal standard to which
30 said results can be normalized,

1 the means for enhancing the signal-to-noise ratio in the mass
2 spectrometric analysis of a specified microorganism, wherein at least one of
3 said microcosm configured to foster the growth of said microorganism while
4 limiting the growth and survival of other, non-specified microorganisms,

5 the determination of the fate of a specified compound in said
6 environment for the purpose of chemical risk assessment, wherein at least one
7 of said microcosms having placed therein said compound,

8 the determination of the effect of a specified compound on the
9 microbial community of said environment for the purpose of chemical risk
10 assessment, wherein at least one of said microcosms having placed therein
11 said compound,

12 the determination of the fate of a specified microorganism for the
13 purpose of biological risk assessment, wherein at least one of said microcosms
14 having placed therein said microorganism,

15 the determination of the effect of a specified microorganism on the
16 microbial community of said environment for the purpose of biological risk
17 assessment, wherein at least one of said microcosms having placed therein
18 said specified microorganism,

19 the determination, for environmental monitoring purposes, of the
20 effect of a specified agent in said environment, wherein at least one of said
21 microcosms having placed therein said agent, said placement being such that
22 said agent is retrievable from said microcosm,

23 the determination, for risk assessment purposes, of the effect of a
24 specified agent in said environment, wherein at least one of said microcosms
25 having placed therein said agent, said placement being such that said agent is
26 retrievable from said microcosm,

27 the determination, for environmental treatment purposes of the effect
28 of a specified agent in said environment, wherein at least one of said
29 microcosms having placed therein said agent, said placement being such that
30 said agent is retrievable from said microcosm,

1 the determination, for environmental monitoring purposes, of the
2 effect of a specified agent in said environment, wherein at least one of said
3 microcosms having placed therein said agent and said device being configured
4 such that said fluid from the surrounding environment that comes into contact
5 with said agent in said microcosm is retrievable,

6 the determination, for risk assessment purposes, of the effect of a
7 specified agent in said environment, wherein at least one of said microcosms
8 having placed therein said agent and said device being configured such that
9 said fluid from the surrounding environment that comes into contact with said
10 agent in said microcosm is retrievable,

11 the determination, for environment treatment purposes, of the effect of
12 a specified agent in said environment, wherein at least one of said microcosms
13 having placed therein said agent and said device being configured such that
14 said fluid from the surrounding environment that comes into contact with said
15 agent in said microcosm is retrievable,

16 the determination, for environmental monitoring purposes, of the
17 effect of a specified biochemical process in said environment, wherein said
18 microcosm covering means being configured so that the duration of said
19 process in said microcosm is controllable,

20 the determination, for risk assessment purposes, of the effect of a
21 specified biochemical process in said environment, wherein said microcosm
22 covering means being configured so that the duration of said process in said
23 microcosm is controllable,

24 the determination, for environmental treatment purposes, of the effect
25 of a specified biochemical process in said environment, wherein said
26 microcosm covering means being configured so that the duration of said
27 process in said microcosm is controllable,

28 the elucidation of the in situ metabolic activity of a specified
29 microorganism, wherein at least one of said microcosms having placed therein
30 an isotope labeled test compound which is to be analyzed for the ratio of light
31 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

1 the detection of a specified microorganism in said environment,
2 wherein at least one of said microcosms having placed therein a test
3 compound suitable for increasing the signal-to-noise ratio of a characteristic
4 biomarker of said microorganism during mass spectrometric analysis
5 following in situ biomarker amplification.

6 40. A testing device as recited in Claim 20, wherein a test microcosm configured so
7 as to aid in addressing research interests chosen from the group consisting of:

8 the identification and linking of the microbial function occurring in
9 said environment to phylogeny, wherein at least one of said microcosms
10 having placed therein an isotope labeled test compound that can be used in
11 conjunction with SIP,

12 the identification and linking of the microbial function occurring in
13 said environment to phylogeny, wherein at least one of said microcosms
14 having placed therein an isotope labeled test compound that can be used in
15 conjunction with mass spectrometry,

16 the survival in said environment of a specified microorganism,
17 wherein at least one of said microcosms having placed therein said specified
18 microorganism,

19 the fate in said environment of a specified, genetically engineered
20 microorganism, wherein at least one of said microcosms is configured to
21 contain said genetically engineered microorganism,

22 the fate in said environment of a specified pathogen, wherein at least
23 one of said microcosms is configured to contain said pathogen,

24 for a specified process in said environment, the effectiveness of
25 specified, varying test substances for their ability to accelerate said process,
26 wherein said test substances are added to said microcosms,

27 the identification of microorganisms indigenous to said environment
28 that are responsible for a desired bioremediation process in said environment,

29 the effectiveness of said varying bioremediation strategies for said
30 environment, wherein said microcosms are configured to be representative of
31 said varying bioremediation strategies,

1 the effectiveness of said varying bioaugmentation strategies for said
2 environment, wherein said microcosms are configured to be representative of
3 said varying bioaugmentation strategies,

4 the effectiveness of said varying chemical treatment strategies for said
5 environment, wherein said microcosms are configured to be representative of
6 said varying chemical treatment strategies,

7 the intrinsic transformation rates in said environment when said
8 environment is contaminated with a specified contaminant,

9 the enhanced transformation rates in said environment when said
10 environment is contaminated with a specified contaminant, wherein specified
11 nutrients are added to said microcosms,

12 the analysis of the microbial community indigenous to said
13 environment,

14 the proteomic analysis of the microbial community indigenous to said
15 environment,

16 the discovery within said environment of novel microorganisms of
17 potential commercial value,

18 the discovery within said environment of novel biochemical processes
19 of potential commercial value,

20 the discovery within said environment of novel natural products of
21 potential commercial value,

22 the normalization of the test results achieved with said device for
23 differences between when and where said tests are conducted, wherein at least
24 one of said microcosms is configured to serve as an internal standard to which
25 said results can be normalized,

26 the means for enhancing the signal-to-noise ratio in the mass
27 spectrometric analysis of a specified microorganism, wherein at least one of
28 said microcosm configured to foster the growth of said microorganism while
29 limiting the growth and survival of other, non-specified microorganisms,

1 the determination of the fate of a specified compound in said
2 environment for the purpose of chemical risk assessment, wherein at least one
3 of said microcosms having placed therein said compound,

4 the determination of the effect of a specified compound on the
5 microbial community of said environment for the purpose of chemical risk
6 assessment, wherein at least one of said microcosms having placed therein
7 said compound,

8 the determination of the fate of a specified microorganism for the
9 purpose of biological risk assessment, wherein at least one of said microcosms
10 having placed therein said microorganism,

11 the determination of the effect of a specified microorganism on the
12 microbial community of said environment for the purpose of biological risk
13 assessment, wherein at least one of said microcosms having placed therein
14 said specified microorganism,

15 the determination, for environmental monitoring purposes, of the
16 effect of a specified agent in said environment, wherein at least one of said
17 microcosms having placed therein said agent, said placement being such that
18 said agent is retrievable from said microcosm,

19 the determination, for risk assessment purposes, of the effect of a
20 specified agent in said environment, wherein at least one of said microcosms
21 having placed therein said agent, said placement being such that said agent is
22 retrievable from said microcosm,

23 the determination, for environmental treatment purposes of the effect
24 of a specified agent in said environment, wherein at least one of said
25 microcosms having placed therein said agent, said placement being such that
26 said agent is retrievable from said microcosm,

27 the determination, for environmental monitoring purposes, of the
28 effect of a specified agent in said environment, wherein at least one of said
29 microcosms having placed therein said agent and said device being configured
30 such that said fluid from the surrounding environment that comes into contact
31 with said agent in said microcosm is retrievable,

1 the determination, for risk assessment purposes, of the effect of a
2 specified agent in said environment, wherein at least one of said microcosms
3 having placed therein said agent and said device being configured such that
4 said fluid from the surrounding environment that comes into contact with said
5 agent in said microcosm is retrievable,

6 the determination, for environment treatment purposes, of the effect of
7 a specified agent in said environment, wherein at least one of said microcosms
8 having placed therein said agent and said device being configured such that
9 said fluid from the surrounding environment that comes into contact with said
10 agent in said microcosm is retrievable,

11 the determination, for environmental monitoring purposes, of the
12 effect of a specified biochemical process in said environment, wherein said
13 microcosm covering means being configured so that the duration of said
14 process in said microcosm is controllable,

15 the determination, for risk assessment purposes, of the effect of a
16 specified biochemical process in said environment, wherein said microcosm
17 covering means being configured so that the duration of said process in said
18 microcosm is controllable,

19 the determination, for environmental treatment purposes, of the effect
20 of a specified biochemical process in said environment, wherein said
21 microcosm covering means being configured so that the duration of said
22 process in said microcosm is controllable,

23 the elucidation of the in situ metabolic activity of a specified
24 microorganism, wherein at least one of said microcosms having placed therein
25 an isotope labeled test compound which is to be analyzed for the ratio of light
26 (non-labeled) and heavy (labeled) biomarkers of said microorganism, or

27 the detection of a specified microorganism in said environment,
28 wherein at least one of said microcosms having placed therein a test
29 compound suitable for increasing the signal-to-noise ratio of a characteristic
30 biomarker of said microorganism during mass spectrometric analysis
31 following in situ biomarker amplification.

- 1 41. A testing device as recited in Claim 17, further comprising a means for remotely
2 controlling the operation of said means for covering said microcosm fluid flow paths.
- 3 42. A testing device as recited in Claim 18, further comprising a means for remotely
4 controlling the operation of said means for covering said microcosm fluid flow paths
5 and said means for causing fluid flow through said microcosms.
- 6 43. A testing device as recited in Claim 19, further comprising a means for remotely
7 controlling the operation of said means for covering said microcosm fluid flow paths.
- 8 44. A testing device as recited in Claim 20, further comprising a means for remotely
9 controlling the operation of said means for covering said microcosm fluid flow paths
10 and said means for causing fluid flow through said microcosms.